

**State of California
Office of Statewide Health Planning and Development
Division of Facility Development
Structural Engineering Section**

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Standard Structural and Anchorage Review Comments
Based on the 2007 California Building Standards Code

**Applicable to OSHPD 1 Projects received after October 1, 2008.
(Revised September 2, 2008)**

(1) Marked Plans and Response

The structural and anchorage comments are shown on this set of drawings in red pen or pencil. Each comment should be identified by a number such as S-1, S-2, S-3, etc, and is enclosed in a cloud.

The text of standard structural comments called out on the review set by "2007(1)" etc, can be found in the attached list of standard structural comments.

The comments all refer to the California Code of Regulations (CCR) Title 24 Part 1 Section 7-125 (b) unless another section of either Title 24 Part 1 or Part 2 is specifically cited.

In order to facilitate the back check, please respond in writing to each comment. Your response may be in the form of a letter or each response may be written on this final review set of drawings near the comment in a color other than red or green. If the responses are presented in a letter, identify the comment by drawing sheet number and the comment number. In both cases, each response should specify how and where on the resubmitted drawings, specifications, or calculations the OSHPD comments have been resolved.

If you have any questions, please do not hesitate to call the Structural Reviewer:

(name)

(phone)

(2) Signature - Structural Engineer

All final structural drawings and specifications shall bear the structural engineer's stamp or seal, signature, and expiration date per California Business and Professions Code, Section 6735 and CCR Title 24 Part 1 Section 7-115(a).

(3) Intent of the Drawings

Due to the difficulty of anticipating every unsatisfactory condition that might exist in connection with the existing work where alteration or reconstruction work is proposed, the following clause or one of similar meaning shall be included on the plans or in the specifications:

The intent of the drawings and specifications is to reconstruct the hospital building in accordance with the California Building Standards Code, Title 24, California Code of Regulations. Should any condition develop not covered by the approved plans and specifications wherein the finished work will not comply with Title 24, California Code of Regulations, a change order detailing and specifying the required work shall be submitted to and approved by OSHPD before proceeding with the work.

Reference: CCR Title 24, Part 1, Section 7-125(b)(1).

(4) Tests and Inspections

A Testing, Inspection and Observation (TIO) program must be developed (specifying Tests and Special Inspections only), submitted and approved during the plan review process. See Section 7-141, Title 24, Part 1 for requirements. An acceptable TIO form can be down loaded from the OSHPD web site.

OSHPD must approve the TIO program including the individuals and / or firms who will perform the specified tests and / or inspections prior to issuance of a building permit.

(5) Documents for approval

Separate the substantiating documentation from the post approval contract documents to be stamped "Approved" by OSHPD and bind them separately. OSHPD only approves plans and specifications, it does not approve substantiating documentation such as calculations, cost estimates, manufacturer cut sheets, etc. These substantiating documents should be submitted if they are

required for approval of the contract documents, and should not be bound in the contract documents to be stamped "Approved". Clearly identify the documents to be stamped "Approved" by numbering all of the sheets that comprise changes to the existing OSHPD "Approved" contract documents. Provide a cover sheet with a complete index of the documents to be stamped "Approved". Changes to the existing OSHPD "Approved" contract documents must be identified by clouding them on the plans or identifying them by some other means.

(6) Nonstructural component and equipment anchorage

Provide details on the plans or in the specifications and substantiating calculations (when necessary) for the support and anchorage of nonstructural components and fixed equipment (See the CAC 2007 Section 7-111 for definition) if:

- a. The equipment has an operating weight over 400 pounds and is mounted directly on the floor or roof, or:
- b. The equipment has an operating weight over 20 pounds and is suspended from the roof, floor, or wall or is supported by vibration isolation devices.

Equipment must be anchored if it is permanently attached to the building utility services such as electricity, gas, or water. For the purposes of this requirement, "permanently attached" shall include all electrical connections except three-prong plugs for duplex receptacles.

OSHPD may require temporary attachments for movable equipment (which is usually stationed in one place) heavier than 400 pounds, when they are not in use (for a period longer than 8 hours).

OSHPD may require attachments for equipment with hazardous contents to be shown on construction documents irrespective of weight.

The anchorage details must be clearly coordinated with the calculations and the manufacturer's literature. Sketches shown in the calculations for the purpose of illustrating the analytical method are not adequate. OSHPD does not approve calculations; therefore, they cannot appear on the approved plans or specifications.

Equipment installation and anchorage should not proceed without OSHPD approved details on the jobsite.

These details and calculations may not necessarily be the responsibility of the

Structural Engineer of Record. (Reference: CCR Title 24, Part 1, Section 7-125(c)(2)(L), 7-125(c)(4)(M), and 7-125(c)(5)(L)).

(7) Temporary and movable equipment

Temporary (structure erected for a period of less than 180 days, CBC 2007 Sections 3103.1 and Appendix Chapter 1, Section 107.1) and movable equipment may be exempt from anchorage and bracing requirements. Where components are identified as “temporary”, the drawings should indicate the expected duration of use and intended permanent replacement component. Equipment may be considered “movable” if during normal use of the component, it is moved from one location to another. Components mounted on wheels to facilitate periodic maintenance or cleaning but which otherwise remain in the same location are not considered movable for the purposes of anchorage and bracing. See CBC 2007 Appendix Chapter 1 Section 105.2 for work exempt from the building permit but **will be required to comply with the California Building Standards Code provisions.**

(8) Design specifications for equipment must specify the design lateral forces that the equipment must resist. Alternatively, the specifications may require that equipment be able to resist the forces required by ASCE 7 Chapter 13 as modified by the CBC 2007 Sections 1613A & 1614A.

(9) Equipment Anchorage Detailing

Show the following note prominently on the plans:

Anchorage of all equipment to be installed, as a part of this project shall be detailed on these plans, except for the following;

- 1. Equipment weighing less than 400 pounds supported directly on the floor or roof.**
- 2. Furniture (non fixed and movable as exempted by the CBC 2007 Appendix Chapter 1 Section 105.2)**
- 3. Temporary or movable equipment (non fixed and movable as exempted by the CBC 2007 Appendix Chapter 1 Section 105.2).**
- 4. Equipment weighing less than 20 pounds supported by vibration isolators.**
- 5. Equipment weighing less than 20 pounds suspended from a roof or floor or hung from a wall.**

Permanent equipment in items 1, 4, and 5 must be supported and

anchored to resist the forces prescribed by Chapter 13 of ASCE 7 as modified by the CBC 2007 Sections 1613A / 1614A and the anchorage shall be approved by the appropriate Design Professional of Record and OSHPD as a part of field reviews / observations. The Inspector of Record shall assure that the above requirements are enforced.

Reference: CBC Title 24 Part 1, Sections 7-125(c)(2)(L), 7-125(c)(3)(C), 7-125(c)(4)(M) and 7-125(c)(5)(L)).

(10) Pipe and Duct Support

Provide calculations and details for the support and bracing of all pipes, ducts, and conduits. If a pre-approved system is specified (the OPA numbers for the acceptable alternatives must be specified on the drawings) for the bracing, calculations and details for the supporting structure are still required. See comment 2007(18).

(11) Building Separations

Pipes, ducts, and conduits which cross building separation spaces shall be designed and detailed to accommodate displacements calculated on the basis noted in ASCE 7 Section 12.12.3. Show the required details on the plans and provide the substantiating calculations, including a longitudinal seismic brace on each side of the building separation, if bracing is required by ASCE 7 Chapter 13 as modified by the CBC 2007 Sections 1613A & 1614A.

(12) Equipment Not In Contract (**NIC**)

For all new or relocated equipment to be installed under the scope of this application and designated as "by others" or "not in contract," it is the responsibility of the architect and / or the structural engineer in general responsible charge of the project to sign and submit the necessary drawings, specifications, and design calculations to OSHPD for review and approval. Alternatively, exclude the equipment from the plans and the scope of this application. All equipment thus excluded can be installed only after obtaining the approval of OSHPD under a separate application.

(13) Equipment anchorage approval

Equipment anchorage details must be approved by OSHPD, prior to fabrication and installation. If the equipment has been specified such that anchorage details can be determined, then the details must be shown on the drawings or in the

specifications. **No reference to "or equal" is allowed unless it is clearly specified that any "or equal" substitutions must be approved by OSHPD by means of a change order.**

(14) Deferred approval

Design of the Seismic Force Resisting System (SFRS), Primary Gravity Load Resisting System (PGLRS) and Stairs shall not be deferred.

Where the anchorage details cannot yet be determined, then their approval may be deferred if all of the following conditions are met:

- 1) The anchorage cannot be fully detailed on the approved drawings or specifications because of variations in product design or manufacture; e.g., the manufacturer has not yet been chosen, or specified equipment is for performance criteria only.
- 2) All items requiring deferred approval are listed under a separate heading on the drawings, preferably on the title sheet, and on a letter size sheet that will be attached to the building permit. This list must include the maximum weight of the equipment for which the supporting structure was designed. **Clearly indicate that OSHPD approval of the deferred portion is required prior to fabrication and / or installation.**
- 3) The drawings and specifications must fully describe the performance and loading criteria for such work. The design of the supporting building structure cannot be deferred; therefore, show the maximum allowable equipment weight on the drawings. When the equipment is chosen, comparing the actual equipment weight to the maximum allowable equipment weight shown on the plans can substantiate the adequacy of the supporting structure.
- 4) The architect and / or engineer responsible for preparation of drawings and specifications for the main project, as listed on the applications, shall review and forward the drawings and specifications for the deferred approval items to OSHPD with the appropriate application form.
- 5) Anchorage details and calculations must be submitted sufficiently in advance of the desired date of approval to provide time for the initial review by OSHPD and at least one cycle of response and back check review.

(15) Anchorage pre-approval

Where contract drawings reference Anchorage Pre-Approval Numbers (OPA) for specific pieces of equipment, the consultant shall verify that the pre-approval is appropriate and review the pre-approved documents to determine what work the pre-approval requires the consultant to perform. If the installation varies in any way from that shown in the Anchorage Pre-Approval document, provide complete calculations for anchorage and bracing of the component and system or calculations that verify that the proposed anchorage and bracing details are better than the pre-approved system.

A copy of the chosen bracing system(s) installation guide / manual shall be on the jobsite prior to starting the installation of the component, equipment, hangers and / or braces.

(16) Pre-approved components and systems "OPA" numbers

Pre-approved nonstructural components installed under the 2007 CBC must have a valid OPA number. Only Pre-approvals specifically approved for use with the 2007 CBC shall be used.

(17) Pre-approved component and system limitations

Some pre-approvals have limitations that require either a deferred submittal (see comment 2007(14) of layout drawings and component design or a pre-engineered design that is a part of the contract documents. All of the preapproved systems require that the seismic lateral force, F_p , including consideration of a_p and R_p , be determined at each level of the building so that brace spacing and anchorage requirements can be determined. Provide all parameters required to compute F_p (e.g. a_p , R_p , S_{DS} , I_p , h , and z at each level) on construction drawings. The District Structural Engineer may approve the seismic lateral force computations.

(18) Pre-approved pipe, duct, and conduit bracing

A. Shop drawings of the support and bracing systems per the pre-approval shall be submitted to the discipline in responsible charge of the project for review to verify that the details are in conformance with all code requirements. The shop drawings shall be in accordance with ASCE 7-05 Section 13.6 as modified by the CBC 2007 Section 1614A.

a) The Structural Engineer Of Record (SEOR) shall verify that the supporting

structure is adequate for the loads imposed on it by the supports and braces installed per the pre-approval in addition to all other loads.

- b) The SEOR will forward the anchorage and bracing plans (including approved change orders for supplementary framing where required) to the discipline in responsible charge with a notation indicating that the plans have been reviewed and are in general conformance with the pre-approval and the design of the project (CAC 2007, Section 7-153(d)).
- c) A "shop drawing stamp" may be used to indicate compliance with this requirement.
- d) The Registered Design Professional (other than SEOR) may provide the shop drawing stamp for small installations at the discretion of the District Structural Engineer.

B. The SEOR shall design any supplementary framing that is needed to resist the loads, maintain stability and/or is required for installation of pre-approved system.

- The supplementary framing shall be submitted to OSHPD as a change order.

C. The shop drawings (with the shop drawing stamp) shall be submitted to the District Structural Engineer to review the F_p for pre-approved system.

D. The shop drawings (with the shop drawing stamp) shall be kept on the jobsite and can then be used for installation of the support and bracing.

- OSHPD field staff will review the installation.

E. A copy of the chosen bracing system(s) installation guide/manual shall be on the jobsite prior to starting the installation of hangers and/or braces.

- It is the contractor's responsibility to obtain copies of OSHPD pre-approvals and furnish the IOR with one copy of each.

F. Components of two or more pre-approved bracing systems shall not be mixed.

- Only one pre-approved bracing system may be used for a run of pipe, duct or conduit.
- Any substitution of component of a pre-approved bracing system shall require OSHPD review and approval.

(19) Fire Sprinklers

Show a note on the plans or in the specifications requiring that the spacing and details of the support and bracing of fire sprinkler piping shall comply with the 2002 edition of NFPA 13 and Chapter 13 of ASCE 7 as modified by the CBC 2007 Sections 1613A / 1614A and SFM Amendments.

Provide details and calculations for the sway bracing and their anchorages to the structure. Design loads for the design of the sway bracing and anchorages shall be computed per Section 13.6.8.3 of the ASCE 7. Where applicable, details for the support and bracing may be referred to an OSHPD pre-approved anchorage system. All shop drawings of the sprinkler system shall be submitted to OSHPD for review and approval prior to installation. **The allowable values for anchors and bracing from NFPA 13 shall not be used.** Refer to the appropriate 2007 CBC material chapters for allowable loads on the specific systems.

(20) Vibration Isolators

For all vibration isolators and their anchorage, provide calculations, details, and / or test data to substantiate the isolator's capacity for vertical and lateral loads or use OSHPD pre-approved isolators. If the anchorage is not pre-approved, then calculations must also be submitted to substantiate the size, quantity, location and connection to the structure of the isolator. The drawings must be closely coordinated with the calculations and clearly specify the manufacturer, model type, model number, base plate size, quantity used and location at each piece of equipment, and how it is attached to the structure. Isolators, which support a component inside the prefabricated unit, will not be reviewed.

(21) Kitchen equipment

Provide calculations and details for the support and anchorage of all kitchen equipment that is to be permanently fastened to the building or utilities.

(22) Grab bars

Show on the plans details of how grab bars and / or tub and shower seats, located in handicapped toilets and shower stalls, are connected to the supporting structure. See Section 1607A.7.2, CBC 2007 for required strength.

(23) Television and monitor brackets

The design of wall or ceiling mounted television and monitor brackets shall comply with Chapter 13 of ASCE 7 as modified by the CBC 2007 Sections 1613A and 1614A. The design shall include: 1) The connection of the bracket to the structure; 2) The supporting structure; 3) The bracket itself; and 4) The connection of the television and monitor to the bracket.

(24) Anchorage to Concrete

Anchorage to concrete shall be designed per Sections 1911A or 1912A subject to limitations there in.

(25) Post-Installed Anchors

For all post installed anchors show on the plans or in the specifications the manufacturer, type, diameter, minimum embedment, concrete type(s) and strength(s). Indicate edge distance and anchor spacing. Reduce anchor capacities due to edge distance and spacing as recommended in the anchor Evaluation Report. Code Application Notices (CANs) 2-1912A.1 & 2-1916A.8 may be used for guidance in determining allowable shear, tension and test loads. Show the actual magnitudes of the test loads on the contract documents. Testing is required per CBC Title 24 Part 2 Section 1916A.8. Copies of CANs may be obtained from OSHPD web site.

(26) Installation of Post Installed Anchors

Show or reference the following note prominently on the plans (non-applicable portion may be excluded):

When installing drilled-in anchors and / or powder driven pins in existing non-prestressed reinforced concrete, use care and caution to avoid cutting or damaging the existing reinforcing bars. When installing them into existing prestressed concrete (pre- or post-tensioned) locate the prestressed tendons by using a non-destructive method prior to installation. Exercise extreme care and caution to avoid cutting or damaging the tendons during installation. Maintain a minimum clearance of one inch between the reinforcement and the drilled-in anchor and / or pin.

(27) Incomplete Submittals

The following comments are based on a preliminary or incomplete submittal. A more thorough review will be made upon resubmittal and additional comments will follow.